**Sex Linkage Worksheet**

Red-green colourblindness is a X-linked recessive trait. What is the chance that a normal-sighted woman whose father was colourblind and a man who is not colourblind will give birth to colourblind children?

**Most of the complexity in genetic problems involves figuring out the genotypes of the people involved in the cross – no exception here.**

Step 1. Write out Let statements

Let XB represent

Let Xb represent

Step 2. Figure out the genotypes of the parents

Dad is easy, he is not colourblind. Being a male, he has one (normal) X chromosome and his other must be Y.

Mom is more difficult. She is not colourblind but her father was. Because she has normal sight, she must have a dominant X allele. Because her dad was colourblind, and all women must get their father’s X chromosome, she must receive her father’s colourblind X allele.

Dad Mom

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Possible Gametes

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Step 3/4. Make and Solve a Punnett Square Step 5. Write out phenotypic frequencies **(INCLUDE SEX!!)**

Step 6: Answer the question in a full sentence.

1. A colourblind man and a normal sighted woman whose father was not have children. If colourblindness is sex-linked recessive, what are the possible phenotypes of their children?
   1. What percent of their children will be carriers?
   2. What percent of their daughters will be carriers?
   3. What percent of their children will have the condition?
2. What is the difference between a sex-linked trait and an autosomal trait?
3. Red eyes is dominant **wild-type** (normal) in fruit flies (*Drosophila*). White eyes is a recessive sex-linked condition. What are the potential offspring of a cross between:
   1. Carrier Red eyed female x Red eyed male
   2. Carrier Red eyed female x white eyed male
   3. Homozygous red eyed female x white eyed male.
   4. White eyed female x red eyed male
4. A particular genetic disorder that causes infertility is caused be a gene located on the Y chromosome. What is the probability that:
   1. A man with this gene will pass it on to his sons? Daughters?
   2. A woman whose father had this gene will pass it down to her sons?
5. A narrow, reduced eye called “bar” is a **dominant** sex-linked condition (XB) in Drosophila and the full wild-type (normal) eye is produced by the recessive allele (Xb). A homozygous wild-type female is mated to a bar-eyed male. Determine the F1 and F2 genotypic and phenotypic expectations.
6. A girl of normal vision, whose father was colourblind, marries a man of normal vision whose father was also colourblind. What type of vision can be expected of their offspring?
7. What are the phenotypic ratios of the potential offspring of a blue eyed, normal-sighted male and a brown eyed female whose father was colourblind. (Assuming blue eyes are autosomal recessive to brown eyes, and colourblindness is X-linked recessive). (include sex in your ratios!)

**Challenge:**

1. The inheritance for polydactyly (the occurrence of extra fingers) is autosomal dominant. The inheritance of hemophilia is sex-linked recessive. What are the phenotypic ratios of the offspring of a hemophilic man, heterozygous for polydactyly marries a woman who carries hemophilia and is not polydactyl.
2. Rett Syndrome (RS) is a disorder of the brain which affects neural development amongst many other symptoms. The mutation that causes Rett Syndrome is found on the X chromosome. This condition almost exclusively affects females. Can you suggest why?
3. How you could figure out if a gene is sex-linked or autosomal? Are there any experiments/crosses you can do?